DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/26/2010 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claims 1-36 are rejected under 35 U.S.C. 112, second paragraph,** as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. **Claims 1 and 30** recite the limitation of “configured for operating at Reynolds numbers in the range between about 20,000 and 300,000" which renders the claim indefinite. It is unclear how the Reynolds number is being calculated for the particular aircraft. What length has been defined for the calculation? Typically a chord length of the main wing is used; however two wings are providing lift in the claimed invention. Further, it is unclear what structure is being required by the Reynolds number requirement, since the Reynolds number is usually based on a variable speed of the aircraft and variable density of the air. Additionally it is unclear what is meant by

"configured for operating" in the Reynolds number range, since the specific operation has not been defined. Any aircraft could be considered to be "operating" at a fairly low Reynolds number when it is taxing before take-off or after landing.

5. **Claim 37** recites the limitation of "configured for operating" which renders the claim indefinite because it is unclear what is being defined as operating.

6. **Claims 2-29 and 31-36** are rejected for being dependant upon rejected Claims 1 and 30.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. **Claims 1-4, 6-20, 36, and 37 rejected under 35 U.S.C. 103(a) as being unpatentable over Delanne (US Patent 2,147,968 A) in view of Cox et al. (US Patent Application Publication 2003/0155463 A1).**

9. Regarding independent **Claims 1 and 37**, Delanne discloses an aircraft configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000 (at least during slow taxing on a runway) and configured for operating at least at flight speeds in the range between about 10m/s to about 20m/s (all of the components of the aircraft are operable at all speeds; for example the control surfaces and engine operate no matter what speed the craft is traveling), and comprising a fore wing (1) and an aft wing (2) in tandem close-coupled arrangement (See Fig. 2), wherein

said aft wing has side panels (7) and control surfaces (6) on at least on of said aft wing and said side panels, and tapered planform with positive sweep (See Fig. 2), said fore wing has non-positive trailing edge sweep (See Fig. 2), the fore wing and aft wing being disposed at different heights (See Figs. 1 and 3), and said arrangement being free of additional wings or tail arrangement. Delanne does not disclose the aircraft arrangement being a micro or mini UAV. Cox et al. teaches an aircraft arrangement which comprises a tandem close-coupled wing arrangement (314+316) and is a mini or micro UAV (See Figs. 2A-2C; "L" is about 40 inches; See Paragraph [0012]). At the time of invention, it would have been obvious to one of ordinary skill in the art to make the aircraft of Delanne a mini or micro UAV operating in the Reynolds number range of between about 20,000 and 300,000 and between about 10m/s to about 20m/s, in view of the teachings of Cox et al. The motivation for doing so would have been to create an aircraft which can be handled in the battlefield (sizing of Cox et al.) yet has high load carrying capabilities and maneuverability (arrangement of Delanne).

10. With regard to **Claims 2-4 and 6-7**, Delanne discloses: the fore wing having straight trailing edges with negative sweep angle (See Fig. 2); the fore wing having negative sweep (See Fig. 2); a fuselage (3); the fore wing being disposed higher than said aft wing at least by the length of an average aft wing chord (See Fig. 3); and the fore wing and aft wing partially overlap each other (See Fig. 4).

11. With regard to dependant **Claims 8-9**, Delanne discloses a tandem arrangement wherein: the sum of the planform wing areas of said tandem arrangement is at least 70% of the product of W x L (See Figs. 4 and 6; the combined planform wing area is

about 100% of W x L); the forewing, aft wing and other elements are disposed to provide longitudinal aerodynamic stability (See Column 4, Lines 34-34).

12. Regarding **Claim 10,** Delanne discloses an aircraft wherein at zero lift the aircraft would experience a positive, nose up, pitching moment because of a larger wing planform in the forward position (See Fig. 2) with that fore wing having a non-positive trailing edge sweep.

13. With regard to dependant **claims 11 and 12**, the fore wing and aft wing have rounded tips (See Fig. 2), at least a portion of the aft wing has negative or positive sweep angle (See element 2 in Fig. 6).

14. With regard to dependant **claims 13-15**, Delanne discloses the aircraft arrangement wherein: the aft wing (2) has aspect ratio between 2.5 and 4; the fore wing (1) has aspect ratio between 3 and 5; planform areas of the aft wing and the forewing are in ratio between 2:1 and 1:1 (See Fig. 6).

15. With regard to dependant **claims 16-19**, Delanne discloses an aircraft arrangement wherein: said control surfaces comprise rudder control surfaces (9) on said side panels (7); the fore wing has side panels (8) with rudder control surfaces (7) on it's side panels and control surfaces (6).

16. Regarding **Claim 20**, Delanne discloses a tractor propeller (12).

17. Regarding **Claim 36**, Cox et al. discloses the size of the UAV to have a fuselage length of about 40 inches which is about equal to 100 centimeters. At the time of invention, it would have been obvious to make the UAV of Delanne and Cox et al. as described above a mini-UAV having at least one of a maximum longitudinal length and

a maximum wingspan between about 20cm and about 1.2m. The motivation for doing so would have been to make the UAV lightweight and backpackable (See Paragraph [0006] of Cox et al.) in view of the teaching of Cox et al.

18. **Claims 21, 22, 25, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delanne and Cox et al. as applied to claim 1 above, and further in view of Cox '398 (US Patent 6,626,398 B1).** Delanne and Cox et al. disclose the UAV as described above but do not disclose the specifics of the wing characteristics. Cox '398 teaches a UAV aircraft arrangement wherein: at least one of said fore wing and aft wing has non-zero dihedral angle (See Table 1); the dihedral angles of the fore wing and of the aft wing are such that the vertical distance between wing tips of said fore wing and said aft wing is greater than the vertical distance between their respective wing roots (See Table 1; -10^{o} anhedral forward wing and -10^{o} dihedral rearward wing); and the aft wing has positive angle of incidence and a section with positive zero lift pitching moment (See Table 1; angle of attack -2^{o} to $+2^{o}$). At the time of invention, it would have been obvious to one of ordinary skill in the art to apply dihedral, diverging fore and aft wings, and positive angle of incidence to the UAV of Delanne and Cox et al. described above and further in view of the teaching of Cox '398.

19. **Claims 5, 23, 24, and 27-29 rejected under 35 U.S.C. 103(a) as being unpatentable over Delanne, Cox et al. and Cox '398 as applied to claims 1 and 4 above, and further in view of Fraser (US Patent 3,954,231 A).** Delanne, Cox et al., and Cox '398 disclose a Mini or Micro UAV as described above. Fraser teaches a tandem wing aircraft configuration wherein: the fore wing is mounted on the upper side

of the fuselage on at least one pylon (See pylons in Fig. 4); the fore wing and aft wing have twist (See separate wing sections in the wings of Fig. 11). With regard to claims 27-29, Fraser teaches a fighter type aircraft (See Fig. 6). It is well known to provide longitudinal aerodynamic instability in these types of aircraft to improve maneuverability. Additionally a pusher propeller is shown in Fig. 10. At the time of invention, it would have been obvious to one of ordinary skill in the art to provide the aircraft arrangement of Delanne, Cox et al., and Cox '398 as described above with the pylon, wing twist, and stability characteristics of Fraser. The motivation for doing so would have been to meet the flight requirements with respect to maneuverability and range for the UAV.

20. **Claims 30-32, 34, are rejected under 35 U.S.C. 103(a) as obvious over the Miles Aircraft Libellula M.35 (please see non-patent literature supplied 02/26/2010) in view of Cox et al. (US Patent Application Publication 2003/0155463 A1).**

21. Regarding **Claim 30**, the Libellula M.35 design discloses an aircraft configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000 comprising a fore wing and an aft wing in tandem (same wing span) close-coupled (top view shows them close together) arrangement, wherein said aft wing has side panels (Side panels located just aft of cross section CC) and control surfaces on at least one of said aft wing (elevators on the aft wing) and said side panels (rudders on side panels), and tapered planform with positive sweep, said fore wing has non-positive trailing edge sweep, the fore wing and aft wing being disposed at different heights (forewing is higher), and said arrangement being free of additional wings or tail arrangement (only has vertical stabilizers on aft wing), and wherein a planform area of

the aft wing is not less than a planform area of the fore wing. But does not disclose the aircraft being a mini or micro UAV. Cox et al. discloses the use of a tandem wing (308) design for a mini or micro UAV (300; Box 100 is 40 in., approx 1 m long; See Paragraph [0012] and Figs. 2A-2C). At the time of invention, it would have been obvious to one of ordinary skill in the art to place the aircraft arrangement of the Libellula M.35 design on a mini or Micro UAV in view of the teaching of Cox et al. The motivation for doing so would have been to provide a lightweight stable reconnaissance vehicle that is easily transportable on the battlefield.

22. Regarding **Claims 31 and 32**, the Libellula M.35 design discloses an aircraft arrangement wherein the planform areas of the aft wing and the fore wing are in ratio between 2:1 and 1:1 (Figures show the aft wing to be larger); and a top view shows the planform area takes up more than 70% of the W x L area.

23. Regarding **Claim 34**, Cox et al. discloses the max longitudinal length and max wingspan to be about 1m, since the craft fits within the box (100), which is between about 20cm and 1.2m.

24. **Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Libellula M.35 in view of Cox et al. as applied to claim 30 above, and further in view of Warsop et al. (US Patent 6,607,162 B2).** Libellula M.35 and Cox et al. disclose the mini-UAV as described above, but do not disclose a maximum longitudinal length and a maximum wingspan not greater than about 15cm. Warsop et al. teaches scaling of a UAV to any size, including micro UAVs of 150mm or less (See Column 1 Lines 10-24). At the time of invention, it would have been obvious to one of ordinary skill in the art

to make the aircraft of Libellula M.35 and Cox et al. with a longitudinal length and a maximum wingspan not greater than about 15cm in view of the teaching of Warsop et al. The motivation for doing so would have been to make the aircraft small and light; suitable for short efficient missions.

25. **Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Delanne in view of Cox et al. as applied to claim 1 above, and further in view of Warsop et al. (US Patent 6,607,162 B2).** Delanne and Cox et al. disclose the mini-UAV as described above, but do not disclose a maximum longitudinal length and a maximum wingspan not greater than about 15cm. Warsop et al. teaches scaling of a UAV to any size, including micro UAVs of 150mm or less (See Column 1 Lines 10-24). At the time of invention, it would have been obvious to one of ordinary skill in the art to make the aircraft of Delanne and Cox et al. with a longitudinal length and a maximum wingspan not greater than about 15cm in view of the teaching of Warsop et al. The motivation for doing so would have been to make the aircraft small and light; suitable for short efficient missions.

Response to Arguments

26. Applicant's arguments filed 05/26/2010 have been fully considered but they are not persuasive.

27. On Page 11, Line 14 to Page 23, Line 31 Applicant argues that the combination of Delanne and Cox et al. is non-obvious because the flight characteristics of the full sized aircraft of Delanne and the UAV of Cox et al. have conflicting requirements. The discussion is largely dependent upon the Reynolds number range limitation of Claim 1.

It is believed that the 112 second paragraph rejection above renders these arguments moot since it is unclear what structural relationship is being defined by limiting the aircraft to a specific Reynolds number range. Additionally, since it is unclear what length is being defined in the calculation of the Reynolds number, the claims can be construed that at least some element of the aircraft operates in the Reynolds number range specified in Claims 1 and 30.

28. On page 22, Section 6, Applicant also argues that simply downsizing the full-scale aircraft of Delanne in view of Cox et al. would result in an aircraft with degraded performance. While degraded performance may be expected, the aircraft could still function. There is still substantial motivation to provide a smaller aircraft which is easily transportable for use on a battlefield. Poor performance is an obvious and acceptable trade-off.

29. On Page 23, Line 6 to Page 24, Line 7 applicant argues that neither Delanne or Libellula disclose fore and aft wings that partially overlap and the planform of the wing areas is not at least 70% of WxL. Figures 4 and 7 of Delanne clearly show a fore and aft wing arrangement which overlap each other. A vertical line can be drawn in both Figures 4 and 7 of Delanne which intersects both the fore and aft wing; thus the wings overlap each other and comprise 100% of WxL.

30. On Page 27 Lines 15-20, applicant argues that Libellula does not disclose a close-coupled arrangement. As is commonly known, airflow over a wing will cause disturbances in the air immediately downstream of the wing. Eventually the air will naturally return to a more stable and orderly state. The fore and aft wing of Libellula are

too close to one another to prevent the disturbances from negatively affecting the performance of the aft wing. This is evidenced by the placement of the fore and aft wings of Libellula at different heights. The wing arrangement of Libellula is considered to be a close-coupled arrangement since the wings clearly have been placed at different heights because they are too near to one another to be placed at the same height.

31. The remaining arguments on Pages 27-30 are believed to be addressed in the rejections set forth above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian M. O'Hara whose telephone number is (571)270-5224. The examiner can normally be reached on Monday thru Friday 10am - 5pm except the first Friday of every Bi-week.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael R. Mansen can be reached on (571)272-6608. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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